



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/848,742	05/17/2004	Masayoshi Hiramoto	10873.792USD1	7331
23552	7590	04/14/2005	EXAMINER	
MERCHANT & GOULD PC P.O. BOX 2903 MINNEAPOLIS, MN 55402-0903			BERNATZ, KEVIN M	
			ART UNIT	PAPER NUMBER
			1773	
DATE MAILED: 04/14/2005				

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/848,742

Applicant(s)

HIRAMOTO ET AL.

Examiner

Kevin M Bernatz

Art Unit

1773

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3, 5, 12-17, 39, 41, 42, 45, 47, 48, 51, 59, 61-63, 65, 66, 69, 71 and 72 is/are pending in the application.
- 4a) Of the above claim(s) 59 is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-3, 5, 12-17, 39, 41, 42, 45, 47, 48, 51, 59, 61-63, 65, 66, 69, 71 and 72 is/are rejected.
- 7) ☒ Claim(s) 5 is/are objected to.
- 8) ☒ Claim(s) all above are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☒ Certified copies of the priority documents have been received in Application No. 09/931,113.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 9/13/04.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date: ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: ____.

DETAILED ACTION

Election/Restrictions

1. Applicant's election of Group I, claims 1 – 3, 5, 12 – 17, 39, 41, 42, 45, 47, 48, 51, 61 – 63, 65, 66, 69, 71 and 72 in the reply filed on 12/30/2004 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)). The restriction is still deemed proper and is made FINAL.

Double Patenting

2. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

3. Claims 1 – 3, 5, 12 – 17, 39, 41, 42, 45, 47, 48, 51, 61 – 63, 65, 66, 69, 71 and 72 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1 – 34, 57 and 58 of U.S. Patent No. 6,767,655 B2. Although the conflicting claims are not identical, they are not patentably

distinct from each other because the limitation that the non-magnetic layer is a "conductor" is encompassed by the presently claimed generic non-magnetic layer.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 65 and 66 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 65 is not descriptive of the claimed subject matter since it recites that the buffer layer is made up of a composition, but then goes on to recite that the wt% of the non-magnetic element is added to the *magnetic layer*, yet the intent is that the amount is applied to the buffer layer. Likewise, the saturation magnetization limitation is limited to the "composition", but the claim recites a "composition" for both the buffer layer *and* the magnetic layer. Again, the limitation is deemed to be directed to the buffer layer. For the purpose of evaluating the prior art, the Examiner had interpreted claim 65 as if it recited the following: *wherein the buffer layer is made of a composition including a non-magnetic element, wherein 10 wt% to 50 wt% of said non-magnetic element is also present in a magnetic layer in contact with the buffer layer, and wherein the saturation magnetization of said buffer layer is not more than 0.2T (see applicants' specification, page 28, lines 27 – 31).*

Claim Objections

6. Claim 5 objected to because of the following informalities: the language "according to any of claim 1" is inconsistent and should be just "according to claim 1".
Appropriate correction is required.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

8. Claims 1 – 3, 5, 12 - 14, 17, 39, 45, 51, 65, 66 and 69 are rejected under 35 U.S.C. 102(e) as being anticipated by Fukuzawa et al. (U.S. Patent App. No. 2005/0030676 A1).

Regarding claim 1, Fukuzawa et al. disclose a magneto-resistive (MR) element comprising an intermediate layer (*Figure 43, element 3*), and a pair of magnetic layers (*elements 2 and 1b*) sandwiching the intermediate layer, wherein one of the magnetic layers is a free magnetic layer in which magnetization rotation with respect to an external magnetic field is easier than in the other magnetic layer (*element 1b*), wherein the free magnetic layer is a multilayer film including at least one non-magnetic layer (*elements 4a and 4b*) and magnetic layers (*elements 1a and 1b*) sandwiching the non-

Art Unit: 1773

magnetic layer, an element area, which is defined by the area of the intermediate layer through which current flows perpendicular to the film plane (*Figure 51, HD x LD*), is not larger than $1000 \mu\text{m}^2$ (*Paragraph 0365, HD x LD = 0.2 \mu\text{m}^2*), and the non-magnetic layer has a thickness d in the range of $2.6 \text{ nm} \leq d < 10 \text{ nm}$ (*Paragraphs 0487, 0514 – 0517, 0526 – 0529, 0555 and 0558*).

While Fukuzawa et al. does not explicitly disclose embodiments meeting the claimed d range, the Examiner notes that Fukuzawa et al. provides sufficient specificity that thickness values up to 5 nm can be utilized as the MR-improving layer (i.e. applicants' "non-magnetic layer"). In addition, the Examiner notes while applicants intend the claimed MR element to be utilized in a CPP-type manner, wherein the current flows perpendicular to the film plane, applicants have not *claimed* such a limitation. Applicants have merely defined what is meant by the claimed "element area" by reference to an area through which current could flow perpendicular to the film plane. Should applicants desire to claim a CPP-type MR element, applicants are suggested to positively recite that in the MR element, the current flows perpendicularly to the film plane. However, while Fukuzawa et al. is directed to a CiP MR structure, the Examiner notes that the differences between a CiP and a CPP structure are deemed well within the knowledge of one of ordinary skill.

Regarding claims 2 and 51, Fukuzawa et al. disclose structures meeting applicants' claimed limitations (*Figure 51 and Paragraph 0587*).

Regarding claims 3, 12 and 13, Fukuzawa et al. disclose free magnetic layers deemed to meet applicants' claimed limitations (*Paragraph 0555*).

Regarding claims 5, 14 and 17, Fukuzawa et al. disclose free magnetic layers deemed to meet applicants' claimed limitations (*Paragraph 0526*). Fukuzawa et al. further disclose embodiments comprising first and second pinned and intermediate layers (*Paragraphs 0550 – 0553*).

Regarding claim 39, Fukuzawa et al. disclose an intermediate layer meeting applicants' claimed limitations (*examples*).

Regarding claim 45, the limitation(s) "serves as a magnetic memory layer" is (an) intended use limitation(s) and is not further limiting in so far as the structure of the product is concerned. Note that "in apparatus, article, and composition claims, intended use must result in a **structural difference** between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. ***If the prior art structure is capable of performing the intended use, then it meets the claim.***

In a claim drawn to a process of making, the intended use must result in a manipulative difference as compared to the prior art." [emphasis added] *In re Casey*, 370 F.2d 576, 152 USPQ 235 (CCPA 1967); *In re Otto*, 312 F.2d 937, 938, 136 USPQ 458, 459 (CCPA 1963). See MPEP § 2111.02. Given that the disclosed free layer is a magnetic material, the Examiner deems that it is clearly capable of meeting the recited intended use limitation.

Regarding claims 65 and 66, Fukuzawa et al. disclose buffer layers meeting applicants' claimed limitations (*Paragraphs 0422 – 0425*).

Regarding claim 69, Fukuzawa et al. disclose controlling the free magnetic layer thickness to meet applicants' claimed limitation (*Paragraph 0592*).

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. Claim 71 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fukuzawa et al. as applied above, and further in view of Sakakima et al. (J. Mag. Mag. Mat., 210, 2000, L20-L24).

Fukuzawa et al. is relied upon as described above.

Fukuzawa et al. fail to disclose the non-magnetic layer comprising a compound meeting applicants' claimed limitations.

However, Sakakima et al. teach that in multi-layered free magnetic layers (*Results and Discussion*), the inclusion of an oxide layer (OL) in between the two magnetic layers results in improved MR ratios (*Abstract and Results and Discussion*).

It would therefore have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the device of Fukuzawa et al. to utilize oxide layers between the two free magnetic layers as taught by Sakakima et al., since such a structure results in improved MR ratios.

Art Unit: 1773

11. Claims 47 and 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fukuzawa et al. as applied above, and further in view of Redon et al. (U.S. Patent No. 6,381,107 B1).

Regarding claims 47 and 48, Fukuzawa et al. is relied upon as described above.

Fukuzawa et al. fail to disclose a flux guide meeting applicants' claimed limitations.

However, Redon et al. teach that in a tunnel junction such as the Fukuzawa et al. invention, the use of a flux guide meeting applicants' claimed limitations can result in improved read output and MR ratio (*col. 2, lines 27 – 55*).

It would therefore have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the device of Fukuzawa et al. to utilize a flux guide meeting applicants' claimed limitations as taught by Redon et al., since such a structure results in improved read output and MR ratio.

12. Claims 1, 5, 12, 13, 15, 17, 39, 45 and 71 are rejected under 35 U.S.C. 103(a) as being unpatentable over Odagawa et al. (U.S. Patent App. No. 2002/0058158 A1) in view of Parkin (U.S. Patent No. 5,585,986).

Regarding claim 1, Odagawa et al. disclose a magneto-resistive (MR) element comprising an intermediate layer (*Figure 8C, element 120*), and a pair of magnetic layers (*elements 250 and 260*) sandwiching the intermediate layer, wherein one of the magnetic layers is a free magnetic layer in which magnetization rotation with respect to an external magnetic field is easier than in the other magnetic layer (*element 250*),

Art Unit: 1773

wherein the free magnetic layer is a multilayer film including at least one non-magnetic layer (*elements 240*) and magnetic layers (*elements 230 and 250*) sandwiching the non-magnetic layer, an element area, which is defined by the area of the intermediate layer through which current flows perpendicular to the film plane, is not larger than $1000\text{ }\mu\text{m}^2$ (*Paragraph 0269*).

Odagawa et al. fail to teach a non-magnetic layer meeting applicants' claimed thickness limitation.

However, Parkin teaches that when forming magnetic layers separated by a non-magnetic spacer layer, depending on the choice of material, one can utilize thickness values meeting applicants' claimed limitations in order to produce suitable antiferromagnetic coupling between the adjacent magnetic layers (*Figure 5 and col. 6, lines 35 – 52*). I.e. that equivalent antiferromagnetic coupling can be obtained by utilizing non-magnetic layer thickness values both in and outside of applicants' claimed range limitation.

Substitution of equivalents requires no express motivation as long as the prior art recognizes the equivalency. In the instant case, non-magnetic coupling layers meeting applicants' claimed thickness limitation and non-magnetic coupling layers not meeting applicants' claimed thickness limitations are equivalents in the field of known non-magnetic coupling layers used in MR elements to produce antiferromagnetic coupling between adjacent ferromagnetic layers, as taught by Parkin above. *In re Fount* 213 USPQ 532 (CCPA 1982); *In re Siebentritt* 152 USPQ 618 (CCPA 1967); *Graver Tank & Mfg. Co. Inc. v. Linde Air Products Co.* 85 USPQ 328 (USSC 1950).

Regarding claims 5, 12, 13, 15 and 17, Odagawa et al. disclose free magnetic layers deemed to meet applicants' claimed limitations (*Paragraph 0526*). Odagawa et al. further disclose embodiments comprising first and second pinned and intermediate layers (*Paragraphs 0550 – 0553*).

Regarding claim 39, Odagawa et al. disclose an intermediate layer meeting applicants' claimed limitations (*examples*).

Regarding claim 45, the limitation(s) "serves as a magnetic memory layer" is (an) intended use limitation(s) and is not further limiting in so far as the structure of the product is concerned. Note that "in apparatus, article, and composition claims, intended use must result in a **structural difference** between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. ***If the prior art structure is capable of performing the intended use, then it meets the claim.***

In a claim drawn to a process of making, the intended use must result in a manipulative difference as compared to the prior art." [emphasis added] *In re Casey*, 370 F.2d 576, 152 USPQ 235 (CCPA 1967); *In re Otto*, 312 F.2d 937, 938, 136 USPQ 458, 459 (CCPA 1963). See MPEP § 2111.02. Given that the disclosed free layer is a magnetic material, the Examiner deems that it is clearly capable of meeting the recited intended use limitation.

Regarding claim 69, Odagawa et al. disclose free layers meeting applicants' claimed thickness limitations (*examples*).

Regarding claim 71, Odagawa et al. disclose non-magnetic layers meeting applicants' claimed limitations (*examples*).

13. Claims 2, 14, 16, 51 and 61 – 63 are rejected under 35 U.S.C. 103(a) as being unpatentable over Odagawa et al. as applied above, and further in view of Fukuzawa et al. ('676 A1).

Odagawa et al. is relied upon as described above.

Regarding claims 2 and 51, Odagawa et al. fails to disclose an area of the free magnetic layer meeting applicants' claimed limitations.

However, Fukuzawa et al. teach that it is known in the art to form the MR element such that the free area meets applicants' claimed limitation in order to produce a MR device with both a narrow track width and a high sensitivity (*Figure 51 and Paragraph 0587*).

It would, therefore, have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the device of Odagawa et al. to utilize a free magnetic layer meeting applicants' claimed limitations as taught by Fukuzawa et al. in order to produce a MR device with both a narrow track width and a high sensitivity.

Regarding claims 14, 16 and 61 – 63, while Odagawa et al. disclose embodiments deemed to read on applicants' claimed free magnetic layer limitations (*examples*), Odagawa et al. fail to disclose a second intermediate layer and a second pinned layer in said embodiments. However, the Examiner notes that MR elements which are pinned on both sides (i.e. "dual element") are known equivalent structures to MR elements which are pinned on only one side ("bottom type" or "top type"), as taught by Fukuzawa et al. (*Paragraphs 0545 – 0555*). Substitution of equivalents requires no

express motivation as long as the prior art recognizes the equivalency. In the instant case, MR elements utilizing a single intermediate layer and a single pinned layer and MR elements utilizing two intermediate layers and two pinned layers are equivalents in the field of known MR elements for use in magnetic heads.

14. Claims 47 and 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Odagawa et al. as applied above, and further in view of Redon et al. ('107 B1).

Regarding claims 47 and 48, Odagawa et al. is relied upon as described above.

Odagawa et al. fail to disclose a flux guide meeting applicants' claimed limitations.

However, Redon et al. teach that in a tunnel junction such as the Odagawa et al. invention, the use of a flux guide meeting applicants' claimed limitations can result in improved read output and MR ratio (*col. 2, lines 27 – 55*).

It would therefore have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the device of Odagawa et al. to utilize a flux guide meeting applicants' claimed limitations as taught by Redon et al., since such a structure results in improved read output and MR ratio.

Conclusion

15. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Several references disclose synthetic free layers utilizing a thin Ru layer for antiferromagnetically coupling the adjacent ferromagnetic layers. In view of

Parkin, these references could also apply under 35 U.S.C. 103(a) since it is merely a matter of selecting a non-magnetic layer of proper thickness to meet applicants' claimed thickness limitation as well as to provide antiferromagnetic coupling. Two of these references are: Gill (U.S. Patent No. 6,275,363 B1) and Gill (U.S. Patent No. 6,271,997 B1). Inomata et al. (U.S. Patent No. 6,114,056) teach a free magnetic layer possessing two layers separated by a non-magnetic layer, wherein the two ferromagnetic layers are *ferromagnetically coupled (Figure 21 and pertinent text)*. Moon et al. (App. Phys. Let., 74(24), 1999, 3690 – 3692) teach controlling the junction area in order to optimize the performance of the free magnetic layer (*entire disclosure*). Dill et al. (U.S. Patent No. 6,114,719) teach a MR element comprising a free layer and an auxiliary ferromagnetic layer separated from the free layer by a non-magnetic layer having a thickness of greater than 2 nm, however the auxiliary layer is not deemed to be "free to rotate" since it is a biasing layer (*entire disclosure*).


16. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kevin M Bernatz whose telephone number is (571) 272-1505. The examiner can normally be reached on M-F, 9:00 AM - 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carol Chaney can be reached on (571) 272-1284. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Art Unit: 1773

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

KMB
April 12, 2005



Kevin M. Bernatz, PhD
Primary Examiner